

Kombinasi Max Pooling dan Global Average Pooling pada Convolutional Neural Networks untuk Prediksi Kanker Kulit

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ABSTRAK

Kanker kulit merupakan salah satu penyakit yang mengancam kesehatan manusia, dengan kasus baru yang terus meningkat setiap tahunnya. Deteksi dini sangat penting untuk meningkatkan tingkat kesembuhan, namun metode diagnosis konvensional seperti biopsi seringkali invasif, lambat, dan mahal. Oleh karena itu, pengembangan sistem diagnosis berbasis kecerdasan buatan, khususnya Convolutional Neural Networks (CNN), menjadi solusi potensial untuk meningkatkan akurasi dan efisiensi diagnosis. Penelitian ini bertujuan untuk mengevaluasi kinerja model CNN dengan kombinasi Max Pooling dan Global Average Pooling (GAP) dalam mendeteksi kanker kulit berdasarkan citra digital. Dataset ISIC (International Skin Imaging Collaboration) digunakan dengan fokus pada dua kategori kanker kulit, yaitu malignant (ganas) dan benign (jinak). Kombinasi Max Pooling dan GAP diharapkan dapat meningkatkan presisi dan mengurangi risiko overfitting. Hasil penelitian menunjukkan bahwa model kombinasi Max Pooling dan GAP mencapai presisi sebesar 96,35%, yang menunjukkan kemampuan model dalam meminimalkan false positive. Namun, recall model kombinasi relatif rendah, yaitu 85,99%, menunjukkan kurangnya sensitivitas dalam mendeteksi kasus malignant. Akurasi model kombinasi mencapai 91,68%, sedikit lebih rendah dibandingkan model yang hanya menggunakan Max Pooling (91,79%). Meskipun kombinasi Max Pooling dan GAP tidak meningkatkan akurasi secara signifikan, model ini mampu mengoptimalkan presisi, yang sangat penting dalam aplikasi medis untuk menghindari kesalahan diagnosis.

Kata kunci: Convolutional Neural Networks (CNN), Pooling, Max Pooling, Global Average Pooling (GAP), Kanker Kulit.

Combination of Max Pooling and Global Average Pooling in Convolutional Neural Networks for Skin Cancer Prediction

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ABSTRACT

Skin cancer is one of the most threatening diseases to human health, with new cases increasing every year. Early detection is crucial to improve recovery rates, but conventional diagnostic methods such as biopsies are often invasive, slow, and costly. Therefore, the development of artificial intelligence-based diagnostic systems, particularly Convolutional Neural Networks (CNN), has become a potential solution to enhance the accuracy and efficiency of diagnosis. This study aims to evaluate the performance of a CNN model combining Max Pooling and Global Average Pooling (GAP) for skin cancer detection based on digital images. The ISIC (International Skin Imaging Collaboration) dataset focused on two categories of skin cancer: malignant and benign. The combination of Max Pooling and GAP is expected to improve precision and reduce the risk of overfitting. The results show that the combined Max Pooling and GAP model achieved a precision of 96.35%, demonstrating its ability to minimize false positives. However, the recall of the combined model was relatively low at 85.99%, indicating reduced sensitivity in detecting malignant cases. The accuracy of the combined model reached 91.68%, slightly lower than the model using only Max Pooling (91.79%). Although the combination of Max Pooling and GAP did not significantly improve accuracy, it was able to optimize precision, which is highly important in medical applications to avoid misdiagnosis.

Keywords: Convolutional Neural Networks (CNN), Pooling, Max Pooling, Global Average Pooling (GAP), Skin Cancer.